

Computer-Interactive Keys

Computer-interactive keys to the eggs, larvae, and early juveniles of catostomid and cyprinid Gila River Basin fishes covered herein, and a family-level key to the larvae of all Gila River Basin fishes can be accessed from the compact disk (CD) in the pocket on the inside rear cover of this guide or downloaded from the Internet as instructed below. These keys consist of data sets with associated image, text, and controlling files for use with the DELTA program, *Intkey* (Dallwitz et al. 1993 et seq., 1995 et seq.). The current version of the host program, *Intkey5* (also provided on the CD or downloadable from the Internet) runs under Microsoft *Windows 95* and later *Windows* operating systems. A color display with at least 800 x 600 pixel resolution (SVGA) is recommended (higher resolutions are preferred), but 640 x 480 pixel resolution (VGA) will work (less text is displayed without scrolling).

Intkey is one of the longer-standing, more highly evolved, and more widely used programs for interactive keys on personal computers (Dallwitz 1993). Many other interactive-key programs are available (e.g., *IdentifyIt*, *LucID*, *MEKA*, *Navikey*, *ONLINE*, *PollyClave*, and *XID*—Dallwitz 1996 et seq.), and some may have worked as well for these keys. However, the catostomid key prepared for Snyder and Muth (2004), the first ever published for fish larvae, used *Intkey* and it was decided to stay with that program rather than start over with a new program and system for storing and formatting data. Also, on the condition that it is not used or distributed for financial gain, *Intkey* is available free over the Internet—an important consideration for potential users of this key. In addition to its function as an interactive key, *Intkey* has a vast array of other options for information retrieval, including output of full or partial "natural-language" descriptions of, or differential comparisons among, selected taxon-items. Once installed, use of *Intkey* is not limited to the data sets provided herein for early life stages of Gila River Basin fishes, or the data set for catostomid fish larvae of the Upper Colorado River Basin (Snyder 2003 et seq., Snyder and Muth 2004); it can be used also with a wide array of data sets for other taxa (e.g., salamanders, crustaceans, beetles, butterflies, polychaetes, flowering plants, grasses, viruses) that are available as part of published guides, on CDs, or over the Internet (go to <http://delta-intkey.com/> and select "data" or "references" for listed applications).

Installation

The keys can be used directly from the "Delta" directory (folder) on the CD or installed on your computer's hard-drive using the compressed *Intkey* program (Intk32.exe) and data set (Cat-grb.zip, Cyp-grb.zip, Fam-grb.zip) distribution files on the CD. Installation of *Intkey* on your hard drive is required if (or when) you anticipate downloading and using future updates of this data set or using *Intkey* with data sets for other taxa. The "Delta" directory on the CD can be copied to and used on your hard drive (or elsewhere), but without installation from the program distribution file, *Intkey* would not be registered within the *Windows* operating system, listed in your start menu under programs, or set up as a helper file for your Internet browser.

In the absence of the CD, "Intk32.exe" can be downloaded from the DELTA Home Page on the Internet (<http://delta-intkey.com/>—select "Programs, documentation, and methodology" then under the programs listing, select *Intkey*). "Cat-grb.zip," "Cyp-grb.zip," and "Fam-grb.zip" can be similarly downloaded from the Colorado State University College of Natural Resources FTP site for LFL (go to "<ftp://ftp.cnr.colostate.edu/pub/lfl/cik-data/>" using your web browser and select the distribution file). Future updates of the data sets will likely be available only over the

Internet. Users should periodically check the download site for subsequently updated copies of the file, as indicated by a later date.

Install *Intkey* by double clicking on "Intk32.exe" from the CD or its downloaded location and following on-screen instructions. Installation in a directory (folder) named "Delta" under either the root directory or "Program Files" is recommended. In addition to the program and an array of bitmap and other files used by *Intkey*, the distribution file also includes and installs a "doc" subdirectory for the user's guide (intkey.doc, a Microsoft *Word* document but readable by most other word processors) and separate text files regarding installation (install.txt), conditions of use (use.txt), and registration (register.txt—*Intkey* can be used without registration, but remains subject to other conditions of use). The full set of program and related files will require about 2.2 Mb of storage memory.

Once *Intkey* is installed, select the data-set distribution files "Cat-grb.zip," "Cyp-grb.zip," and "Fam-grb.zip," one at a time, and using *WINZIP*, or another suitable decompression program, expand the distribution files into the directory in which you've installed *Intkey*. They will expand as subdirectories called "Cat-grb," "Cyp-grb," and "Fam-grb," respectively, and each includes five files and two further subdirectories ("images" and "rtf"). The current data sets and associated files require less than 3 Mb of storage memory.

Use

As noted above, the *User's Guide to Intkey* (Dallwitz, et al. 1995 et seq.) is included as "intkey.doc" in the folder "delta/doc" on the CD included with this guide, as well as in the *Intkey* distribution package on the CD or the Internet. Although all information needed for use of *Intkey* is included in program help files, first-time users are encouraged to read the user's guide, at least the first few pages through "Information Retrieval."

To start the program and use the key directly from the provided CD, open the "Delta" directory and double click on "intkey5.exe." *Intkey* will open with one of the three data-set names highlighted in an index window (startup dialog box). If your CD drive is designated as drive "D," just select (highlight) the key data set you want (if not already highlighted) and click on "OK" to open that data set; if your CD drive is not designated as drive "D" or the data set you want is not listed, click on Browse and in the appropriate subdirectory (Cat-grb, Cyp-grb, or Fam-grb) click on and open the corresponding startup file, "intkey-cat-grb.ink," "intkey-cyp-grb.ink," or "intkey-fam-grb.ink."

To run *Intkey* after it is installed on your computer's hard drive, press the *Windows* "Start" button, then select "Programs," "Delta," and "*Intkey*" (for convenience, a startup icon can be placed on your *Windows* desktop). The startup index window will be displayed. If the data-set name you want is listed, select it if not already highlighted, and click on "OK" to open the data set. If the data-set name is not yet listed in the index window (as upon first use after installation), browse for the appropriate subdirectory (e.g., Cat-grb) and select and open the corresponding startup file (e.g., intkey-cat-grb.ink); upon closing the data set or program, you will be given to the opportunity to add the data set to the startup index.

Upon opening a data set, a startup image with the name of the key and author will be displayed. Press enter or click on the screen to close the image and start the key. The standard interactive-key screen will be initially overlaid with introductory and instructional text windows. After reading their contents, close or minimize the text windows (if closed, they can be redisplayed by selecting the desired text file from the "information" index—click on the book icon

in the top left corner of the screen beneath "File"). Upon closing the text files, the standard screen will be revealed with its main menu, character and taxon-item toolbars, and four integral windows (available or best-remaining characters in upper left, used characters in lower left, remaining taxon items in upper right, and eliminated or non-matching taxon items in lower right). The relative size of the four windows can be changed at any time by moving the dividers between them.

For general instructions on use of the *Intkey* program, select or click on "Introduction" under the "Help" menu (upper left, main menu). As directed therein, for description of the various toolbar buttons and their use, click on the "<?" help button in the upper right corner of the screen, above the end of the taxon-item toolbar, then on the desired toolbar button. Doing so for the "restart button" (curved arrow, left-most button in the upper right toolbar of "Best Characters" window) reveals the basic steps for proceeding with the key.

Before beginning identification, limit taxon possibilities (candidate species) by selecting only those species (for families) likely in your collection. Click on the "use subset of taxa" button (green oval icon, second from the right in the "Remaining Taxa" toolbar, upper right window), then in the special window brought up by that button, select the appropriate subset of taxa individually from the list of taxa (e.g., in the catostomid key, if only desert sucker and Sonora sucker are known to be the only covered catostomids in the river reach you have sampled, select just those species). Taxa to be considered in the key can be changed at any time.

Inappropriate or unfamiliar characters can be simply ignored and skipped over, but if desired, specific subsets of characters can also be selected (e.g., a subset without skeletal characters if the specimen to be identified has not been cleared, or a subset without morphometric characters if the user is unable to make such measurements). To select or deselect subsets of characters, click on the "use subset of characters" button (yellow oval icon, second from right in the "Best Characters" or "Available Characters" toolbar, upper left window). Proceed with identification as per basic instructions (click on the "help" (<?), then "restart" buttons).

With the exception of internal skeletal characters in the catostomid key (and the circumstance mentioned in the next paragraph), all characters in these keys are based on external or externally visible morphology and pigmentation and can be assessed without dissection or destructive treatment. Internal skeletal characters included for catostomid metalarvae and early juveniles are intended for cleared and, preferably, bone-stained specimens, although careful dissection might also reveal the state of those characters.

Pigmentation characters used in these keys (and referenced in catostomid and cyprinid comparative summary tables) refer only to the black or brown pigment of melanophores (melanin-bearing cells). The pigment of most other chromatophores is difficult to preserve and has not been assessed. However, in living, freshly euthanized, and alcohol-preserved metalarvae and juveniles (not first fixed in formalin), melanophore pigmentation of the peritoneum (membrane lining the visceral cavity), as well as the degree of gut coiling, is often obscured by a layer of silvery iridophores. In such cases, it may be necessary to cut open the visceral cavity to examine the inner surface of the peritoneum and folds of the gut.

The catostomid and cyprinid keys are generally limited to specimens 40 mm or less in SL. However, some larger early (young-of-the-year) juveniles can be successfully identified with these keys by treating them as 40-mm-SL juveniles. Meristic characters such as fin-ray and scale counts in these keys are also applicable to all later juveniles and adults but may not be sufficient for definitive identification of these larger fish. The family key covers only the larval period.

As noted in the "Introduction" under the "Help" menu, the program opens in "normal mode" which limits users to preset options and is generally recommended for beginning or less-experienced users. However, depending on screen resolution, text for some character-state options might not be fully displayed. Increasing the width of the "Best Characters" or "Available Characters" window will increase the amount of text displayed in each line, but sometimes not enough. In these few cases, the user's only option is to cancel the selected character, switch to "advanced mode" under the "File" menu, again select the desired character, and in the character display box, click on the button for "Full Text" which is then displayed in a separate window. Unfortunately, this option is not currently available in "normal mode."

Taxonomic keys are tools for specimen identification, but the responsibility for accurate determinations remains with the user. Computer-interactive keys are simply easier-to-use and much more flexible tools than traditional printed keys, but as such they should facilitate more accurate identifications by the user. In the case of these keys, even with their extensive character sets, the identity of closely related fish larvae of similar developmental state and size cannot always be resolved to a single species; and even when it is, because true character ranges may extend beyond those observed for description, and because of possible errors by the author or user, the results are not necessarily conclusive. As discussed earlier in this guide, the possibility of hybrids among candidate taxa can further confound or reduce confidence in the resulting identification. Upon resolution of identity to a single taxon or if no matches are found, *Intkey* provides a help file with suggestions for confirming identity or allowing for some mismatches (increasing error tolerance) and continuing with the key. By allowing a couple of mismatches, even when identity is resolved to a single species, the user can base his or her identification on more characters and be more confident of the results. To further confirm the identity suggested by the key, users should also critically compare the specimen in question with descriptive information and illustrations in the species accounts and comparative summary tables and, if available, with preserved reference specimens. As noted earlier, identities that cannot be resolved with reasonable certainty should be either treated tentatively as the most likely species with a question mark following the determination (and perhaps with an explanatory footnote) or identified conservatively only to genus or family (e.g., *Catostomus* sp. or unidentified catostomid).

Please report any problems, discrepancies, errors, or observed character-range extensions for future updates of these computer-interactive-key data sets directly to:

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Fax: 970-491-5091,
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If these keys are to be referenced separately from their inclusion in this guide, the suggested citations are, using Transactions of the American Fisheries Society journal format for Internet sources:

Snyder, D. E., and S. C. Seal. 2004 et seq. Computer-interactive key to eggs, larvae, and early juveniles of native catostomid fishes in the Gila River Basin (data set for use with DELTA *Intkey*). Larval Fish Laboratory, Colorado State University, Fort Collins. Available: <ftp://ftp.cnr.colostate.edu/pub/lfl/cik-data/>, select distribution file cat-grb.zip (January 2005).

Snyder, D. E., and S. C. Seal. 2004 et seq. Computer-interactive key to eggs, larvae, and early juveniles of selected cyprinid fishes in the Gila River Basin (data set for use with DELTA *Intkey*). Larval Fish Laboratory, Colorado State University, Fort Collins. Available: <ftp://ftp.cnr.colostate.edu/pub/lfl/cik-data/>, select distribution file cyp-grb.zip (January 2005).

Seal, S. C., and D. E. Snyder. 2004 et seq. Computer-interactive key to families of fish larvae of fishes in the Gila River Basin (data set for use with DELTA *Intkey*). Larval Fish Laboratory, Colorado State University, Fort Collins. Available: <ftp://ftp.cnr.colostate.edu/pub/lfl/cik-data/>, select distribution file fam-grb.zip (January 2005).

Replace the date in parentheses at the end of each citation with the date you personally last accessed the site and verified presence of the file.

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